

Extravehicular Activity (EVA) Microbial Swab Tool

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HAT: 6.1a, 6.1b, 6.2b, 6.2c TA: 6.1, 6.2 TRL: Start 4 / Current 6

OVERVIEW

When we send humans to search for life on Mars, we'll need to know what we brought with us versus what may already be there. To ensure our crewed spacecraft meet planetary protection requirements--and to protect our science from human contamination--we'll need to know whether micro-organisms are leaking/venting from our ships and spacesuits. This is easily done by swabbing external vents and surfaces for analysis, but there was no US EVA tool for that job. NASA engineers developed an EVA-compatible swab tool that can be used to collect data on current hardware, which will influence eventual Mars life support and EVA hardware designs.

INNOVATION

This technology pairs a Space Shuttle-era tool handle with a commercially available swab and JSC-built sterile container. The assembly allows EVA-suited crew to collect microbial samples from their suits or external spacecraft vents. A 3D printer was used to rapidly prototype various design concepts for comparison and functional testing.

OUTCOME

- Identified a commercial sterile swab product
- 3D-printed prototype swab tip holders helped refine the design
- Glovebox and thermal testing completed

INFUSION SPACE / EARTH

Once flight-certified, this tool can be used on board ISS to sample life support system external vents. Variations on this tool – such as replacing the swab tip with a sticky tape – could be used for other types of EVA sampling, such as collecting orbital debris impact residue for failure analysis.

PARTNERSHIPS / COLLABORATIONS

This project brings together engineers and scientists from 8 different JSC organizations (XM, XX, XI, CB, EA, EC, ER, SK), 3 other NASA Centers (JPL, ARC & GSFC) and 2 external organizations (SETI Institute & University of Florida)



PAPERS / PRESENTATIONS

Summary to be published at the IEEE Aerospace Conference in Big Sky Montana (March, 2016)

FUTURE WORK

This tool will be used to support a 2016 research effort to characterize the types of microbial contaminants leaking from various EVA suits. By piggy-backing onto planned suit tests, data can be collected with little additional expense.



NASA cooperative education student Mary Walker demonstrates how the EVA swab tool would collect a microbial sample on an EVA glove spacesuit joint, worn by fellow designer Drew Hood.